GAS MONITOR
Model 2350-00
Model 2360-00

APPLICABILITY & EFFECTIVITY

This manual provides instructions for the following Sierra Monitor products:

Model	Description
2350-00	Gas Monitor - Toxic Only
2360-00	Gas Monitor - Toxic & Combustible

The instructions are effective for the above models as of March 1, 1999

Instruction Manual Part Number: <u>T10011</u>
Rev. B

TABLE OF CONTENTS

1.0 PRODUCT DESCRIPTION

1.1 INTRODUCTION

The Model 2350 and 2360 series Gas Monitors provide continuous monitoring of Methane (and other Combustibles) and Carbon Monoxide gas simultaneously in a confined space to provide safety for personnel and to reduce the hazard of gas explosion. Both models are designed to operate from a -48 VDC power source typically available in telephone equipment applications. The monitors are designed for use primarily in telephone equipment cabinets.

Model 2350 has one sensor which is factory calibrated to detect Carbon Monoxide at 100 PPM and has cross sensitivity to Hydrogen and Methane (CH_4). Model 2360 has both a Carbon Monoxide sensor factory calibrated to 100 PPM Carbon Monoxide and a Combustible Gas sensor calibrated to 5,000 PPM Methane.

Models 2360-00 (figure 1.1) and 2350-00 (figure 1.2) are designed for installation in a customer supplied three position electrical junction box.

Features of the Models 2350 and 2360 include:

♦ Local visual and audible alarms.
♦ Ambient temperature change compensation.
♦ Long-life solid state gas and temperature sensors.
♦ -48 VDC operation.
♦ Five alarm relay contacts (2360), four alarm relay contacts (2350).
♦ User selectable active or passive relay alarm test.
♦ Single PC board assembly for easy installation and maintenance.
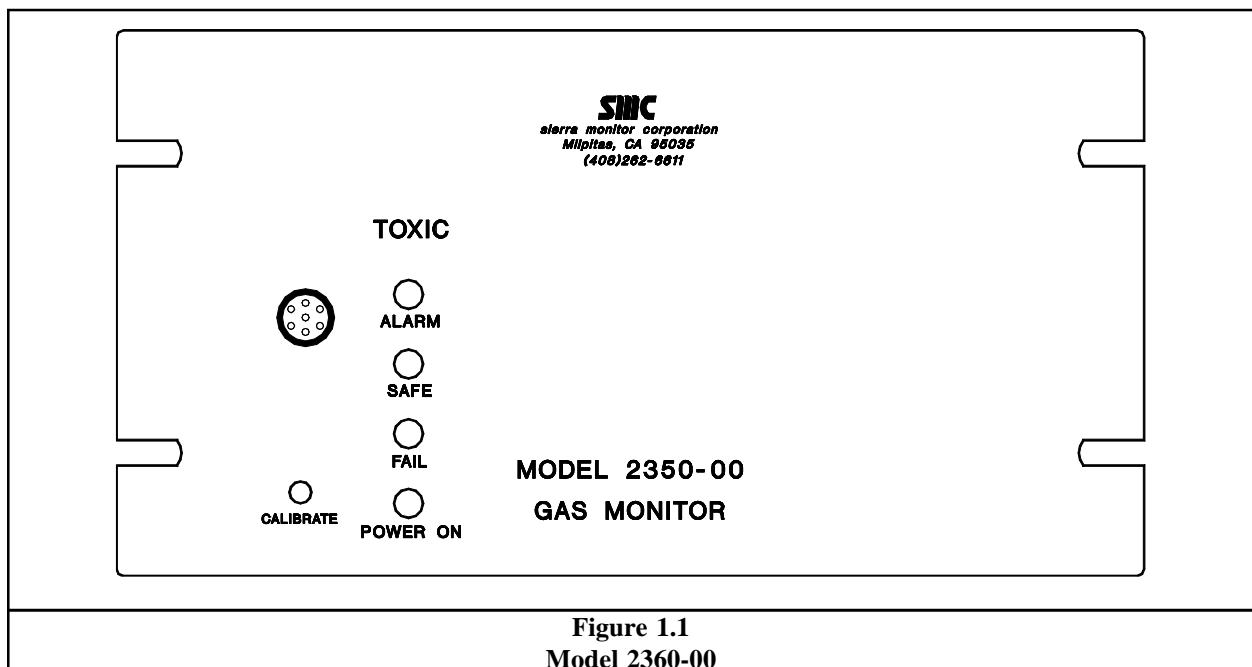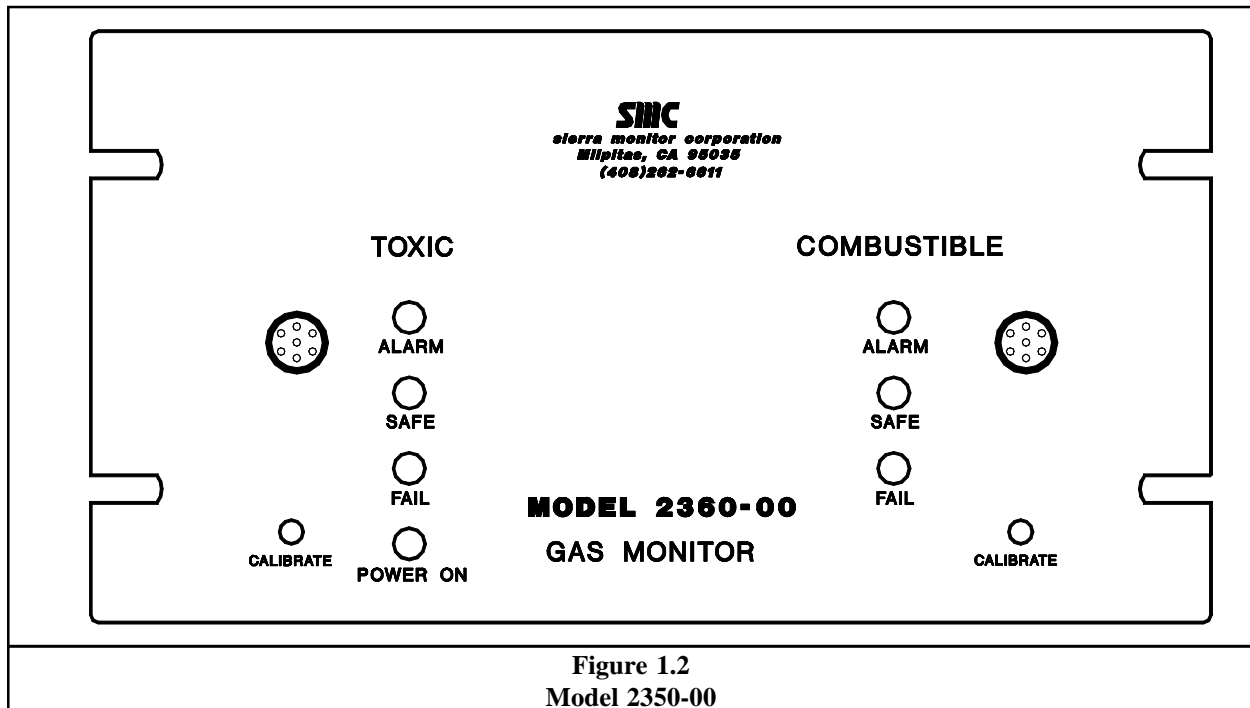♦ Alarm test contacts on PC board.
♦ Fused vent relay.

Figure 1.1
Model 2360-00

Figure 1.2
Model 2350-00

1.2 GENERAL DESCRIPTION

1.2.1. MECHANICAL

The Gas Monitor is comprised of a printed circuit assembly mounted behind a flat cover plate which serves as the instrument cover when installed into a user supplied, three position electrical gang box (figure 1.3).

Electrical connections for power (-48 VDC) and relays (dry contact alarm activated) are made via screw terminals on the printed circuit board prior to installation into the gang box.

Calibration adjustment potentiometers are accessible through the cover plate.

- **SENSORS**: Gas and temperature compensating sensors are installed onto the printed circuit assembly and are protected by the cover plate. The sensors can be replaced by removal of the monitor from the gangbox. The Combustible and Carbon Monoxide sensors are metal-oxide semiconductor type solid state devices for long life. The electrical resistance of the sensors is inversely proportional to the gas concentration.

- **CONNECTORS**: All user connections are made via convenient multi-position screw terminal strip located on the component side of the printed circuit assembly. Wiring access to the monitor can be determined by the installer by selecting any hub knockout on the gang box.
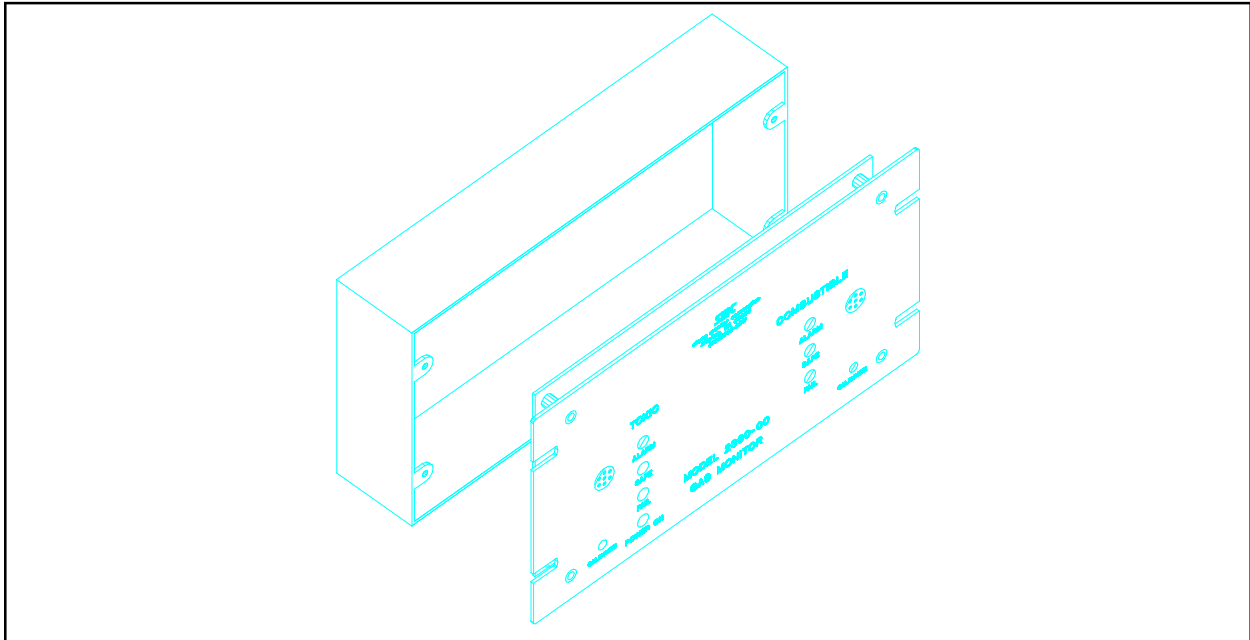
Figure 1.3
Models 2350, 2360 Mechanical

1.2.2. ALARM RELAYS

There are five alarm relays (Note: Combustible Gas relay is not installed on Model 2350-00). All are single-pole double-throw with 6 amp dry non-inductive contacts at 120/240 volts AC.

- **FAILURE RELAY**: The failure relay is activated when either gas sensor becomes defective (open sensor resistance or no heater voltage). The failure relay is normally energized so it will also be activated if the -48 VDC power fails.

- **CARBON MONOXIDE RELAY**: The Carbon Monoxide Relay is activated when the concentration exceeds the calibrated threshold setting (100 PPM CO).

- **COMBUSTIBLE RELAY**: The Methane Relay is activated when the concentration of Methane exceeds the calibrated threshold setting (5000 PPM CH_4).

- **VENTILATION RELAY:** The Ventilation Relay is activated when either the CO or CH_4 gas concentration exceed their calibration levels. The common contact of the ventilation relay is fused with a 4 amp socketed micro-fuse.

- **REMOTE INDICATOR RELAY:** The Remote Indicator Relay is activated when either the Failure Relay or the Ventilation Relay is activated. Any of the following conditions will activate the Remote Indicator Relay.

  * Excess Carbon Monoxide
  * Excess Methane (Model 2360 only)
  * Loss of -48 VDC
  * Carbon Monoxide sensor failure
  * Methane sensor failure (Model 2360 only)

1.2.3. ALARM INDICATORS

The Model 2350 front panel has one audible alarm and four LED annunciation lights.

- **AUDIBLE ALARM:** The Audible Alarm will sound when either the CO or CH_4 gas concentration exceeds the respective calibrated threshold levels. The Audible Alarm produces a continuous tone of 2900 Hz at 68 dB.

- **POWER FAILURE ALARM:** The Power-On Failure Alarm consists of a Power-On Lamp (green) which glows when -48 VDC is present and turns off if power is lost.

- **CARBON MONOXIDE STATUS LIGHTS:** The three CO status lights are: Safe (green), Alarm (red) and Sensor Failure (red).

The Model 2360 has an additional three LED annunciation lights.

- **COMBUSTIBLE STATUS LIGHTS:** The three Combustible status lights are: Safe (green), Alarm (red) and Sensor Failure (red).

1.2.4. TEST SWITCHES

Test point pairs located on the component side of the printed circuit board (figure 1.4) are provided to allow testing of the following functions:

- **LAMP TEST:** When the lamp test pins are shorted together all LED indicators, and the audible alarm, are activated.

- **ALARM TEST:** When the alarm test pins (W3) are first shorted together then (W4) ares shorted, all LED indicators, three relays (ventilation, Carbon Monoxide, and Combustible gas) and the audible alarm are activated.

- **FAILED SENSOR TESTS**: When the respective failed sensor test pins are shorted together a failure of the selected sensor will be simulated. During this test the sensor failure LED indicator will glow and the Fail and Remote relays will activate.
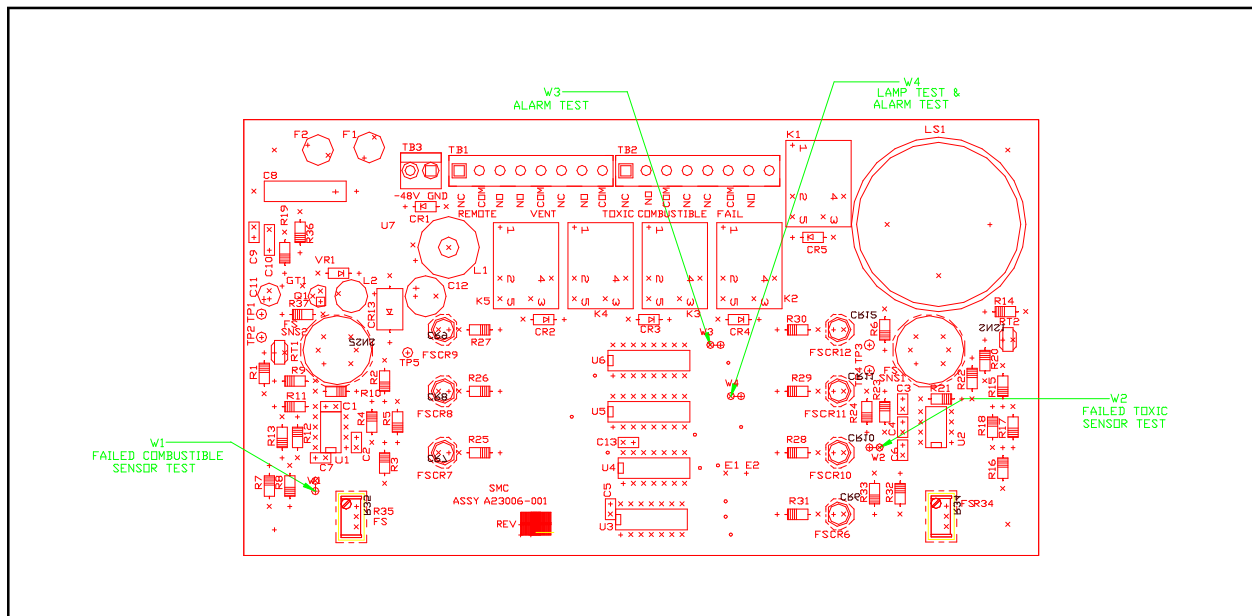

Figure 1.4
Test Point Locations

2.0 INSTALLATION

2.1 UNPACKING AND INSPECTION

Remove the gas monitor from its packing container and inspect to insure that all items listed on the packing slip have been received in good condition.

2.2 INSTALLATION AND SET-UP

2.2.1. ENCLOSURE MOUNTING

Install a three position gang box (not supplied) on a vertical surface in the location selected for the gas monitor. Entry for power supply wiring and for alarm contacts should be supplied through conduit connected to the knock out.

2.2.2. INTERFACE WIRING

D.C. POWER: Pull -48 VDC wiring into the gang box, allow 10" of service loop and strip 1/8" of insulation to prepare for connection to the monitor.

ALARM RELAYS: Pull any required alarm relay wiring into the gang box, allow 10" of service loop and strip 1/8" of insulation for connection to the monitor.

WIRING CONNECTIONS: Using Figure 2.1 as a guide, connect the -48 VDC wiring and the alarm relay wiring to the appropriate terminal points. Open the terminals by turning the locking screw counterclockwise, insert the wire so that the full 1/8" strip is inside the connector and close the connector securely by turning the screw clockwise.
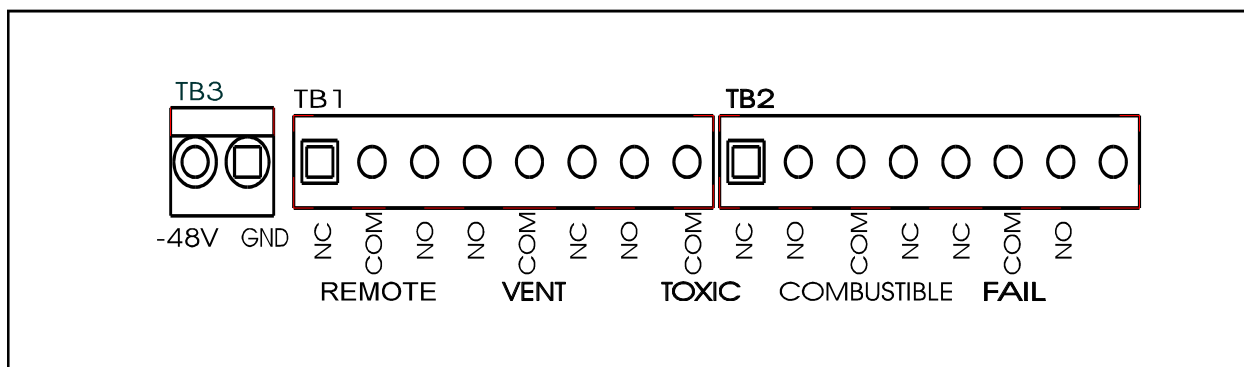
Figure 2.1
Interface Wiring Terminal Positions

2.2.3. START-UP

POWER ON: Apply power to the -48 VDC wiring. After a short pause the audible alarm will sound and the alarm lights will light on the front panel. The alarms will stabilize within five minutes at which time the audible will cease and the "safe" lights on the front panel will light.

MONITOR STABILIZATION: During the first 24 hours of operation the sensors may be unstable and alarms may occur. Alarms should be ignored during this period and remote annunciation should not be activated.

3.0   OPERATION

The Model 2350 and 2360 require no operator intervention except for periodic calibration. The following information can be followed to insure that the initial installation and external wiring is correct.

3.1 STATUS INDICATION

Table 1 describes status of each indicator under various conditions:

CONDITION	System Power	CO Safe	CO Alarm	CO Fail	Methane Safe	Methane Alarm	Methane Fail	CO	CH4	Fail	Vent	Remote	AUDIBLE
POWER ON													
Safe	ON	ON			ON								
CO Alarm	ON		ON		ON			ON			ON	ON	ON
CH4 Alarm	ON	ON				ON			ON		ON	ON	ON
CO Fail	ON			ON	ON					ON		ON	
CH4 Fail	ON	ON					ON			ON		ON	
TEST LIGHTS													
Active	ON	ON	ON	ON	ON	ON	ON	ON	ON		ON		ON
Passive	ON	ON	ON	ON	ON	ON	ON						ON

TABLE 1
STATUS INDICATORS

3.2 FUNCTION TESTS

The following function tests can be performed to confirm the conditions described in Table 1. Use Figure 1.4 (page 4) to locate test points.

- **TEST LIGHTS:** Short the "Test Lights" test points and check that all panel lights turn "ON" and that the audible alarm turns on. If the "active " relay test is used the Carbon Monoxide, Combustible and Vent relays will activate during this test.

- **FUNCTION TEST**: Apply gas from a cigarette lighter (without flame) or other high concentration source to the Methane sensor and check that the Combustible Alarm light goes on.

- **FAILED SENSOR TESTS**: When the respective failed sensor test pins are shorted together a failure of the selected sensor will be simulated. During this test the sensor failure LED indicator will glow and the Fail and Remote relays will activate.

4.0 CALIBRATION

4.1 FREQUENCY OF CALIBRATION

The manufacturer recommends that the Model 2350 or 2360 be calibrated as follows:

- During the first three months of operation: Calibrate every 30 days.

- Upon completion of three months operation: Calibrate every 90 days.

4.2 CALIBRATION PROCEDURE

PREPARATION: Locate the two (one for Model 2350) span adjusting potentiometers which are visible on the front panel. Adjustment of these potentiometers raises and lowers the sensitivity of the respective gas sensor. Also locate the two LED alarm indicators for the respective gases.

CALIBRATION - METHANE: Apply 5000 PPM Methane calibration gas at 50 cc/minute to the combustible sensor and watch for the alarm indicator to turn on. If the indicator turns on within approximately five seconds of application of the gas and turns off within approximately five seconds of removal of the gas the sensor is correctly calibrated. If the indicator fails to turn on, keep the gas on the sensor and adjust the potentiometer clockwise until the calibration indicator turns on. If the indicator turns on too quickly and stays on for too long after removal of the gas, adjust the potentiometer counter-clockwise to decrease the sensitivity and repeat the calibration process.

CALIBRATION - CARBON MONOXIDE: Apply Carbon Monoxide calibration gas to the CO sensor. (100 PPM CO at 50 cc/minute). Watch for the alarm indicator to turn on. If the indicator turns on within approximately one minute of application of the calibration gas and turns off within approximately one minute after removal of the calibration gas the sensor is correctly calibrated. Adjust the sensitivity as described in the preceding paragraph.

NOTE: Sierra Monitor Corporation recommends using the Gas Sensor Calibrator, Model 1200-26, for calibration of Combustible and Carbon Monoxide sensors.

4.3 MAINTENANCE

Except for periodic calibration as described above, no routine maintenance is required. The following items may require replacement due to age and deterioration:

SENSOR: To remove a sensor, first turn off the power to the monitor and remove it from the gang box (four screws, two on each end of the cover plate). Remove the cover plate by unscrewing the remaining four screws on the cover plate. The individual sensors are plugged into the PC board and can be lifted out and replaced. Note that there is no special orientation required when the six pin sensor is plugged into the socket. Reassemble the monitor by reversing the above procedure, apply power and allow 24 hours for stabilization prior to re-calibration.

NOTE TO INSTALLERS:

Field data shows that the Model 2350 & 2360 Gas Monitors operates well in the installed, continuous operation cabinet. This is because the environmental conditions in the cabinet are relatively stable.

Various minor difficulties occur during the installation and initial check-out due to major variations in climatic conditions and due to the inspection occurring very quickly after the monitor has been turned on.

Upon initial turn-on the monitor requires a stabilization period which varies based on the amount of time it has been stored and the temperature during stabilization. Longer storage times and colder temperatures increase the stabilization time required. As the specified lower operating temperature of the monitor is 32$^\text{o}$F it may not be possible to perform function checks in assembly areas where the temperature is below freezing.

5.0 SPECIFICATIONS & SPARE PARTS

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SPECIFICATIONS

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<tr><td>**INPUT POWER**</td><td>-48 VDC
4 Watts Max.</td></tr>
<tr><td>**OPERATING TEMPERATURE**</td><td>32 to 104°F (0 - 40°C)</td></tr>
<tr><td>**CALIBRATION RANGE**</td><td>Carbon Monoxide: 50 - 200 PPM
Methane: 2,500 - 12,500 PPM (5% - 25% LEL)</td></tr>
<tr><td>**FACTORY CALIBRATION**</td><td>Carbon Monoxide: 100 PPM
Methane 5000 PPM</td></tr>
<tr><td>**RESPONSE TIME**</td><td>Less than 30 Seconds</td></tr>
<tr><td>**ENCLOSURE**</td><td>None - Fits 3 position electrical gang box.</td></tr>
<tr><td>**CONNECTORS**</td><td>Screw clamp terminal block, 14-22 AWG, 10 A @ 300 VAC</td></tr>
<tr><td>**OUTPUT RELAYS**</td><td>Five SPDT (FORM C) -2360, Four SPDT (Form C) - 2350
6 AMP Non-Inducting @ 120/240VAC
1/8 HP Load</td></tr>
<tr><td>**GAS SENSORS**</td><td>Solid-state metal-oxide semiconductor sensors .</td></tr>
<tr><td>**TEMPERATURE SENSOR**</td><td>Solid state sensors</td></tr>
<tr><td>**AUDIBLE ALARM**</td><td>68db at 2900 Hz</td></tr>
<tr><td>**FUSE**</td><td>2 Amp (main), 4 Amp (vent relay)</td></tr>
<tr><td>**SIZE**</td><td>9" X 5" X 1.5" (22.9 X 12.7 X 3.8 cm)</td></tr>
<tr><td>**WEIGHT**</td><td>3 lbs. (1.3 kg)</td></tr>
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SPARE PARTS LIST

CALIBRATION ACCESSORIES

Model No.	Description
1200-26	Gas Sensor Calibrator w/2 gas cylinders
1290-03	Gas Cylinder - Methane 5000 PPM
1290-05	Gas Cylinder - Carbon Monoxide 100 PPM

MODEL 2350 and 2360 SERIES SPARE PARTS

Part No.	Description
SPJ33003	Sensor, Combustible
SPJ33007	Sensor, Carbon Monoxide (50-200 PPM)
SPJ49088	Fuse, 2 Amp, Micro Package - Main F2
SPJ49085	Fuse, 4 Amp, Micro Package - Vent F1

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</table>

6.0   LIMITED WARRANTY

SIERRA MONITOR CORPORATION warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. SMC will repair or replace without charge any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by SMC personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without SMC approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables (ie. calibration gases, batteries, sensors), nor to any damage resulting from battery leakage.

In all cases SMC's responsibility and liability under this warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above, SMC disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of SMC for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.